

# MATHEMATICS

*Time allowed : 3 hours*

*Maximum Marks : 100*

## GENERAL INSTRUCTIONS :

- (i) All questions are compulsory.
- (ii) The question paper consists of 34 questions divided into four sections - A, B, C and D.
- (iii) Section A contains 10 questions of 1 mark each, which are multiple choice type questions, Section B contains 8 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 6 questions of 4 marks each.
- (iv) There is no overall choice in the paper. However, internal choice is provided in one question of 2 marks, three questions of 3 marks and two questions of 4 marks.
- (v) Use of calculators is not permitted.

QUESTION PAPER CODE 30/1/1

## SECTION - A

*Question Numbers 1 to 10 carry 1 mark each. For each of the questions 1 to 10, four alternative choices have been provided, of which only one is correct. Select the correct choice.*

1. The roots of the equation  $x^2 + x - p(p + 1) = 0$ , where  $p$  is a constant, are
  - (A)  $p, p + 1$
  - (B)  $-p, p + 1$
  - (C)  $p, -(p + 1)$
  - (D)  $-p, -(p + 1)$
2. In an AP, if  $d = -2$ ,  $n = 5$  and  $a_n = 0$ , then the value of  $a$  is
  - (A) 10

- (B) 5
- (C) -8
- (D) 8

3. In Fig. 1, O is the centre of a circle, AB is a chord and AT is the tangent at A. If  $\angle AOB = 100^\circ$ , then  $\angle BAT$  is equal to

- (A)  $100^\circ$
- (B)  $40^\circ$
- (C)  $50^\circ$
- (D)  $90^\circ$

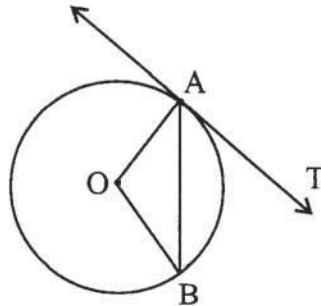


Fig.1

4. In Fig. 2, PA and PB are tangents to the circle with centre O. If  $\angle APB = 60^\circ$ , then  $\angle OAB$  is

- (A)  $30^\circ$
- (B)  $60^\circ$
- (C)  $90^\circ$
- (D)  $15^\circ$

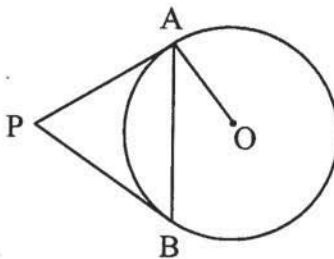


Fig. 2

5. The radii of two circles are 4 cm and 3 cm respectively. The diameter of the circle having area equal to the sum of the areas of the two circles (in cm) is

- (A) 5
- (B) 7
- (C) 10
- (D) 14

6. A sphere of diameter 18 cm is dropped into a cylindrical vessel of diameter 36 cm, partly filled with water. If the sphere is completely submerged, then the water level rises (in cm) by

- (A) 3

- (B) 4  
(C) 5  
(D) 6
7. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower is  $45^\circ$ . The height of the tower (in metres) is  
(A) 15  
(B) 30  
(C)  $30\sqrt{3}$   
(D)  $10\sqrt{3}$
8. The point P which divides the line segment joining the points A(2, -5) and B(5, 2) in the ratio 2:3 lies in the quadrant  
(A) I  
(B) II  
(C) III  
(D) IV
9. The mid-point of segment AB is the point P(0, 4). If the coordinates of B are (-2, 3) then the coordinates of A are  
(A) (2, 5)  
(B) (-2, -5)  
(C) (2, 9)  
(D) (-2, 11)
10. Which of the following cannot be the probability of an event?  
(A) 1.5  
(B)  $\frac{3}{5}$   
(C) 25%  
(D) 0.3

## SECTION B

*Question Numbers 11 to 18 carry 2 marks each.*

11. Find the value of  $p$  so that the quadratic equation  $px(x-3)+9=0$  has two equal roots.
12. Find whether  $-150$  is a term of the AP  $17, 12, 7, 2, \dots$ ?
13. Two concentric circles are of radii  $7$  cm and  $r$  cm respectively, where  $r > 7$ . A chord of the larger circle, of length  $48$  cm, touches the smaller circle. Find the value of  $r$ .
14. Draw a line segment of length  $6$  cm. Using compasses and ruler, find a point  $P$  on it which divides it in the ratio  $3:4$ .
15. In Fig. 3,  $APB$  and  $CQD$  are semi-circles of diameter  $7$  cm each, while  $ARC$  and  $BSD$  are semi-circles of diameter  $14$  cm each. Find the perimeter of the shaded region.  $\left[ \text{Use } \pi = \frac{22}{7} \right]$

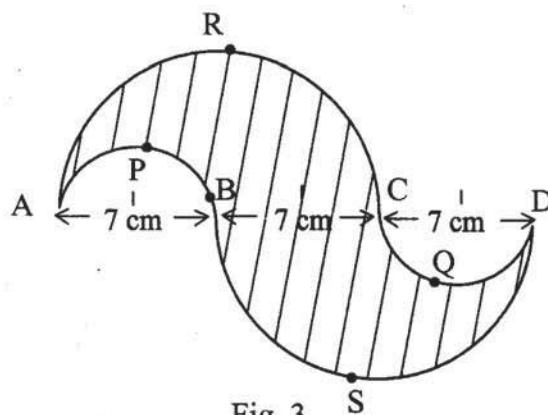


Fig. 3

Or

Find the area of a quadrant of a circle, where the circumference of circle is  $44$  cm.  $\left[ \text{Use } \pi = \frac{22}{7} \right]$

16. Two cubes, each of side  $4$  cm are joined end to end. Find the surface area of the resulting cuboid.
17. Find that value(s) of  $x$  for which the distance between the points  $P(x, 4)$  and  $Q(9, 10)$  is  $10$  units.
18. A coin is tossed two times. Find the probability of getting at least one head.

## SECTION C

*Question numbers 19 to 28 carry 3 marks each.*

19. Find the roots of the following quadratic equation:

$$2\sqrt{3}x^2 - 5x + \sqrt{3} = 0$$

20. Find the value of the middle term of the following AP :

$-6, -2, 2, \dots, 58.$

**OR**

Determine the AP whose fourth term is 18 and the difference of the ninth term from the fifteenth term is 30.

21. In Fig. 4, a triangle ABC is drawn to circumscribe a circle of radius 2 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 4 cm and 3 cm respectively. If area of  $\Delta ABC = 21 \text{ cm}^2$ , then find the lengths of sides AB and AC.

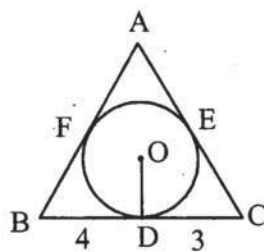


Fig. 4

22. Draw a triangle ABC in which  $AB = 5 \text{ cm}$ ,  $BC = 6 \text{ cm}$  and  $\angle ABC = 60^\circ$ . Then construct a triangle whose sides are  $\frac{5}{7}$  times the corresponding sides of  $\Delta ABC$ .

23. Find the area of the major segment APB, in Fig 5, of a circle of radius 35 cm and  $\angle AOB = 90^\circ$ .

$$\left[ \text{Use } \pi = \frac{22}{7} \right]$$

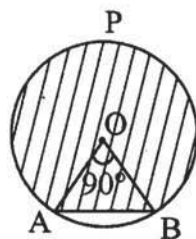


Fig. 5

24. The radii of the circular ends of a bucket of height 15 cm are 14 cm and  $r$  cm ( $r < 14$  cm). If the volume of bucket is  $5390 \text{ cm}^3$ , then find the value of  $r$ .  $\left[ \text{Use } \pi = \frac{22}{7} \right]$
25. Two dice are rolled once. Find the probability of getting such numbers on two dice, whose product is a perfect square.

**Or**

A game consists of tossing a coin 3 times and noting its outcome each time. Hanif wins if he gets three heads or three tails, and loses otherwise. Calculate the probability that Hanif will lose the game.

26. From the top of a tower 100 m high, a man observes two cars on the opposite sides of the tower with angles of depression  $30^\circ$  and  $45^\circ$  respectively. Find the distance between the cars.  $[\text{Use } \sqrt{3} = 1.73]$
27. If  $(3, 3)$ ,  $(6, y)$ ,  $(x, 7)$  and  $(5, 6)$  are the vertices of a parallelogram taken in order, find the values of  $x$  and  $y$ .
28. If two vertices of an equilateral triangle are  $(3, 0)$  and  $(6, 0)$ , find the third vertex.

**Or**

Find the value of  $k$ , if the points  $P(5, 4)$ ,  $Q(7, k)$  and  $R(9, -2)$  are collinear.

### SECTION D

*Question Numbers 29 to 34 carry 4 marks each.*

29. A motor boat whose speed is 20 km/h in still water, takes 1 hour more to go 48 km upstream than to return downstream to the same spot. Find the speed of the stream.

**Or**

Find the roots of the equation  $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$ ,  $x \neq -4, 7$



30. If the sum of first 4 terms of an AP is 40 and that of first 14 terms is 280, find the sum of its first  $n$  terms.

**Or**

Find the sum of the first 30 positive integers divisible by 6.

31. Prove that the lengths of tangents drawn from an external point to a circle are equal.
32. In Fig. 6, arcs are drawn by taking vertices A, B and C of an equilateral triangle ABC of side 14 cm as centres to intersect the sides BC, CA and AB at their respective mid-point D, E and F. Find the area of the shaded region.  $\left[ \text{Use } \pi = \frac{22}{7} \text{ and } \sqrt{3} = 1.73 \right]$

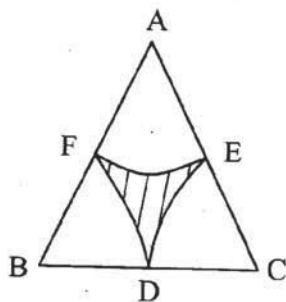


Fig. 6

33. From a solid cylinder whose height is 15 cm and diameter 16 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid.  $[\text{Take } \pi = 3.14]$
34. Two poles of equal heights are standing opposite to each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are  $60^\circ$  and  $30^\circ$ , respectively. Find the height of the poles.

QUESTION PAPER CODE 30/1

### SECTION - A

*Question numbers 1 to 10 carry 1 mark each. For each of the question numbers 1 to 10, four alternative choices have been provided, of which only one is correct. Select the correct choice.*

1. The roots of the equation  $x^2 - 3x - m(m + 3) = 0$ , where  $m$  is a constant, are
- (A)  $m, m + 3$
- (B)  $-m, m + 3$

- (C)  $m, -(m+3)$   
 (D)  $-m, -(m+3)$
2. If the common difference of an A.P. is 3, then  $a_{20} - a_{15}$  is  
 (A) 5  
 (B) 3  
 (C) 15  
 (D) 20
3. In Figure 1, O is the centre of a circle, PQ is a chord and PT is the tangent at P. If  $\angle POQ = 70^\circ$ , then  $\angle TPQ$  is equal to

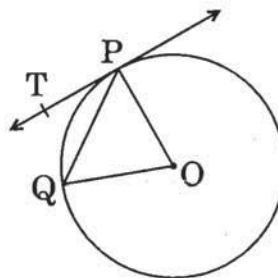


Figure 1

- (A)  $55^\circ$   
 (B)  $70^\circ$   
 (C)  $45^\circ$   
 (D)  $35^\circ$
4. In Figure 2, AB and AC are tangents to the circle with centre O such that  $\angle BAC = 40^\circ$ . Then  $\angle BOC$  is equal to

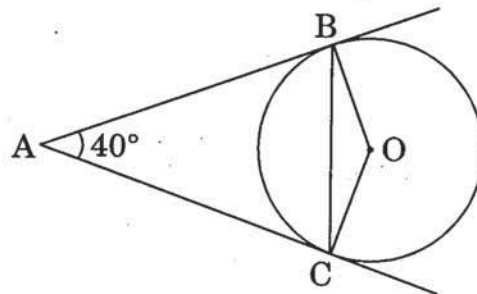


Figure 2

- (A)  $40^\circ$   
 (B)  $50^\circ$   
 (C)  $140^\circ$   
 (D)  $150^\circ$



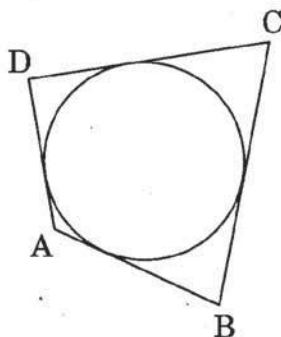
5. The perimeter (in cm) of a square circumscribing a circle of radius  $a$  cm, is
- (A)  $8a$
  - (B)  $4a$
  - (C)  $2a$
  - (D)  $16a$
6. The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge  $4.2$  cm is
- (A)  $4.2$
  - (B)  $2.1$
  - (C)  $8.4$
  - (D)  $1.05$
7. A tower stands vertically on the ground. From a point on the ground which is  $25$  m away from the foot of the tower, the angle of elevation of the top of the tower is found to be  $45^\circ$ . Then the height (in meters) of the tower is
- (A)  $25\sqrt{2}$
  - (B)  $25\sqrt{3}$
  - (C)  $25$
  - (D)  $12.5$
8. If  $p\left(\frac{a}{2}, 4\right)$  is the mid-point of the line-segment joining the points  $A(-6, 5)$  and  $B(-2, 3)$ , then the value of  $a$  is
- (A)  $-8$
  - (B)  $3$
  - (C)  $-4$
  - (D)  $4$

9. If A and B are the points  $(-6, 7)$  and  $(-1, -5)$  respectively, then the distance  $2AB$  is equal to
- (A) 13  
(B) 26  
(C) 169  
(D) 238
10. A card is drawn from a well-shuffled deck of 52 playing cards. The probability that the card will not be an ace is
- (A)  $\frac{1}{13}$   
(B)  $\frac{1}{4}$   
(C)  $\frac{12}{13}$   
(D)  $\frac{3}{4}$

### SECTION B

*Question numbers 11 to 18 carry 2 marks each.*

11. Find the value of  $m$  so that the quadratic equation  $mx(x - 7) + 49 = 0$  has two equal roots.
12. Find how many two-digit numbers are divisible by 6.
13. In Figure 3, a circle touches all the four sides of a quadrilateral ABCD whose sides are  $AB = 6$  cm,  $BC = 9$  cm and  $CD = 8$  cm. Find the length of side AD.



*Figure 3*

14. Draw a line segment AB of length 7 cm. Using ruler and compasses, find a point P on AB such that  $\frac{AP}{AB} = \frac{3}{5}$ .
15. Find the perimeter of the shaded region in Figure 4, if ABCD is a square of side 14 cm and APB and CPD are semicircles.  $\left[ \text{Use } \pi = \frac{22}{7} \right]$

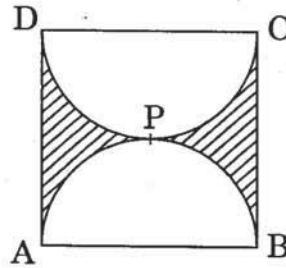


Figure 4

16. Two cubes each of volume  $27 \text{ cm}^3$  are joined end to end to form a solid. Find the surface area of the resulting cuboid.

OR

A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere.

17. Find the value of  $y$  for which the distance between the points  $A(3, -1)$  and  $B(11, y)$  is 10 units.
18. A ticket is drawn at random from a bag containing tickets numbered from 1 to 40. Find the probability that the selected ticket has a number which is a multiple of 5.

### SECTION C

Question numbers 19 to 28 carry 3 marks each.

19. Find the roots of the following quadratic equation:

$$x^2 - 3\sqrt{5}x + 10 = 0$$

20. Find an A.P. whose fourth term is 9 and the sum of its sixth term and thirteenth term is 40.
21. In Figure 5, a triangle PQR is drawn to circumscribe a circle of radius 6 cm such that the segments

QT and TR into which QR is divided by the point of contact T, are of lengths 12 cm and 9 cm respectively. If the area of  $\Delta PQR = 189 \text{ cm}^2$ , then find the lengths of sides PQ and PR.

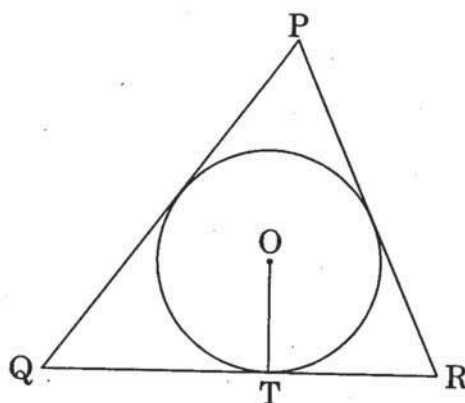


Figure 5

22. Draw a pair of tangents to a circle of radius 3 cm, which are inclined to each other at an angle of  $60^\circ$ .

**OR**

Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then construct another triangle, whose sides are  $\frac{3}{5}$  times the corresponding sides of the given triangle.

23. A chord of a circle of radius 14 cm subtends an angle of  $120^\circ$  at the centre. Find the area of the corresponding minor segment of the circle.  $\left[ \text{Use } \pi = \frac{22}{7} \text{ and } \sqrt{3} = 1.73 \right]$
24. An open metal bucket is in the shape of a frustum of a cone of height 21 cm with radii of its lower and upper ends as 10 cm and 20 cm respectively. Find the cost of milk which can completely fill the bucket at Rs. 30 per litre.  $\left[ \text{Use } \pi = \frac{22}{7} \right]$
25. Point P(x, 4) lies on the line segment joining the points A(-5, 8) and B(4, -10). Find the ratio in which point P divides the line segment AB. Also find the value of x.
26. Find the area of the quadrilateral ABCD, whose vertices are A(-3, -1), B(-2, -4), C(4, -1) and D(3, 4).

**OR**

Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are A(2, 1), B(4, 3) and C(2, 5).

27. From the top of a vertical tower, the angles of depression of two cars, in the same straight line with the base of the tower, at an instant are found to be  $45^\circ$  and  $60^\circ$ . If the cars are 100 m apart and are on the same side of the tower, find the height of the tower. [Use  $\sqrt{3} = 1.73$ ]
28. Two dice are rolled once. Find the probability of getting such numbers on the two dice, whose product is 12.

**OR**

A box contains 80 discs which are numbered from 1 to 80. If one disc is drawn at random from the box, find the probability that it bears a perfect square number.

### **SECTION D**

*Question numbers 29 to 34 carry 4 marks each.*

29. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.
30. The first and the last terms of an A.P. are 8 and 350 respectively. If its common difference is 9, how many terms are there and what is their sum?

**OR**

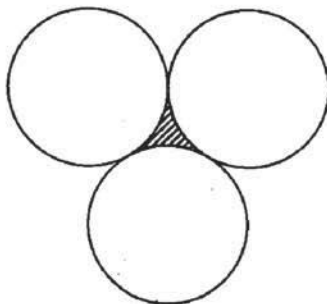
How many multiples of 4 lie between 10 and 250? Also find their sum.

31. A train travels 180 km at a uniform speed. If the speed had been 9 km/hour more, it would have taken 1 hour less for the same journey. Find the speed of the train.

**OR**

Find the roots of the equation  $\frac{1}{2x-3} + \frac{1}{x-5} = 1$ ,  $x \neq \frac{3}{2}, 5$ .

32. In Figure 6, three circles each of radius 3.5 cm are drawn in such a way that each of them touches the other two. Find the area enclosed between these three circles (shaded region).  $\left[ \text{Use } \pi = \frac{22}{7} \right]$



*Figure 6*

33. Water is flowing at the rate of 15 km/hour through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in the pond rise by 21 cm ?
34. The angle of elevation of the top of a vertical tower from a point on the ground is  $60^\circ$ . From another point 10 m vertically above the first, its angle of elevation is  $30^\circ$ . Find the height of the tower.